

MULTIMEDIA



UNIVERSITY

STUDENT IDENTIFICATION NO

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# MULTIMEDIA UNIVERSITY

## FINAL EXAMINATION

TRIMESTER 1, 2016/2017

### BMF1014 – MATHEMATICS FOR FINANCE

(All Sections / Groups)

13 OCTOBER 2016  
9.00 a.m. - 11.00 a.m.  
(2 Hours)

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#### INSTRUCTIONS TO STUDENT

1. This question paper consists of 4 pages, inclusive of a list of formulae.
2. Attempt all 4 questions. The distribution of marks for each question is given.
3. Students are allowed to use scientific calculators.
4. Please write your answers in the **Answer Booklet** provided.

**Question 1 [Total = 25 marks]**

- a) Office equipment was purchased for RM40,000 and is assumed to have a scrap value of RM8,000 after 10 years. If its value is depreciated linearly from RM40,000 to RM8,000.
- Find the linear equation that relates value ( $V$ ) in RM to time ( $t$ ) in years. [5 marks]
  - What would be the value of the equipment after 6 years? [2 marks]
- b) For the following system of equations:
- $$\begin{aligned}5x_1 - 3x_2 + 2x_3 &= 13 \\2x_1 - x_2 - 3x_3 &= 1 \\4x_1 - 2x_2 + 4x_3 &= 12\end{aligned}$$
- Write the system into matrix form  $AX = B$  [2 marks]
  - Find the determinant of matrix  $A$ . [3 marks]
  - Find the cofactor, adjoint and inverse of matrix  $A$ . [10 marks]
  - Using inverse method, solve the system of equations above. [3 marks]

**Question 2 [Total = 25 marks]**

- a) Use row operations to change the following matrix to reduced form.
- $$\left[ \begin{array}{ccc|c} 1 & 0 & -3 & 1 \\ 0 & 1 & 2 & 0 \\ 0 & 0 & 3 & -6 \end{array} \right]$$
- [6 marks]
- b) Rental costs for office space have been going up at 4.8% per year compounded annually for the past 5 years. If office space rent is now RM20 per square foot per month, what were the rental rates 5 years ago? [5 marks]
- c) A company estimates that it will need RM100,000 in 8 years to replace a computer. If it establishes a sinking fund by making fixed monthly payments into an account paying 7.5% compounded monthly, how much should each payment be? [6 marks]
- d) A motorcycle costs RM35,000. You pay 20% downpayment and amortize the rest with equal monthly payments over a 12-year period. If you must pay 8.75% compounded monthly,
- what is your monthly payment? [6 marks]
  - How much interest will you pay? [2 marks]

Continued.....

**Question 3 [Total =25 marks]**

a) Find the derivatives of the following functions using the appropriate techniques.

i.  $y = \frac{(x^2 + 2)(x^2 + x + 3)}{x^3}$  [3 marks]

ii.  $y = \frac{1}{4}(5x^2 + 2)^4$  [4 marks]

b) Find  $y'$  given  $2x^2y - xe^y = x$ . [6 marks]

c) The monthly demand for a product is given by  $p = -0.003x + 160$  where  $x$  is the number of units and  $p$  is the price per unit. Find the marginal revenue function. [4 marks]

d) For the given function  $f(x) = 2x^3 - 7x^2 + 4x - 1$ .

i. Find the critical points. [4 marks]

ii. Find the intervals on which the function is increasing and decreasing. [4 marks]

**Question 4 [Total =25 marks]**

(a) Evaluate the following integrals.

$$\int \frac{2t}{3t^2 - 1} dt$$
 [7 marks]

(b) Smiley Shirt's is a company that sells children t-shirts in Damansara. This company manufactured two types of t-shirts, A and B. If  $x$  is the number of units A and  $y$  is the number of units B, then the cost and revenue in ringgit are:

$$C(x, y) = -5y^2 + 6xy + 12x - 4y - 7$$

$$R(x, y) = 4x^2 - 2y^2 - 6xy + 140x + 100y + 10$$

Find the numbers of each type of product that should be manufactured to maximize profit. What is the maximum profit?

[18 marks]

**End of paper**

**LIST OF FORMULAE**

1. Quadratic Formula [ $ax^2 + bx + c = 0$ ,  $a \neq 0$ ]

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

2. Simple Interest

- (i) Interest:  $I = Prt$  ( $P$  = principal,  $r$  = interest rate,  $t$  = number of years)  
(ii) Accumulated amount,  $A = P(1 + rt)$

3. Compound Interest

- (i) Accumulated amount,  $A = P(1 + i)^n$  where  $i = \frac{r}{m}$  and  $n = mt$   
(ii) Present value for compound interest,  $P = A(1 + i)^{-n}$

4. Effective Rate of Interest,  $r_{\text{eff}} = \left(1 + \frac{r}{m}\right)^m - 1$

5. Future Value of an Annuity,  $S = R \left[ \frac{(1 + i)^n - 1}{i} \right]$

6. Present Value of an Annuity,  $P = R \left[ \frac{1 - (1 + i)^{-n}}{i} \right]$

7. Amortization Formula,  $R = \frac{Pi}{1 - (1 + i)^{-n}}$

8. Sinking Fund Formula,  $R = \frac{Si}{(1 + i)^n - 1}$

## 9. Basic Rules of Differentiation

- a) Derivative of a constant:  $\frac{d}{dx}(c) = 0$
- b) Power rule:  $\frac{d}{dx}(x^n) = nx^{n-1}$
- c) Sum rule:  $\frac{d}{dx}[f(x) \pm g(x)] = \frac{d}{dx}[f(x)] \pm \frac{d}{dx}[g(x)]$
- a) Product rule:  $\frac{d}{dx}[f(x)g(x)] = f(x)g'(x) + g(x)f'(x)$
- b) Quotient rule:  $\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{g(x)f'(x) - f(x)g'(x)}{[g(x)]^2}$
- c) Chain rule:  $\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}$
- d) General Power rule:  $\frac{d}{dx}[u^n] = nu^{n-1} \frac{du}{dx}$
- e) Logarithmic function:  $\frac{d}{dx}(\ln u) = \frac{1}{u} \left(\frac{du}{dx}\right)$
- f) Exponential function:  $\frac{d}{dx}(e^u) = e^u \frac{du}{dx}$

## 10. Basic Rules of Integration

- a) Indefinite integral of a constant:  $\int k \, du = ku + C$
- b) Power rule:  $\int u^n \, du = \frac{u^{n+1}}{n+1} + C$
- c) Sum rule:  $\int [f(u) \pm g(u)] \, du = \int f(u) \, du \pm \int g(u) \, du$
- d) Logarithmic function:  $\int \frac{1}{u} \, du = \ln u + C$
- e) Exponential function:  $\int e^u \, du = e^u + C$
- f) Integration by Parts:  $\int U \, dv = UV - \int V \, du$